REMARKS

Claims 1-26 were pending in the present application. Claim 14 has been amended as set forth above. Claim 5 has been cancelled without prejudice or disclaimer to the subject matter therein. It is respectfully submitted that the pending claims define allowable subject matter.

In the outstanding Office Action, the drawings are objected to under 37 C.F.R. 1.83 (a) as not showing every feature of the invention specified in the claims. The specification is objected to under 35 U.S.C. §112, first paragraph, as failing to provide an enabling disclosure and failing to support the invention as it is now claimed. Claims 1-26 are rejected under 35 U.S.C. §112, first paragraph, for the reasons set forth in the objection to the specification. Claim 14 stands rejected under 35. U.S.C §112, second paragraph, as being indefinite. Claims 1-26 are rejected under 35 U.S.C. §103 as being unpatentable over Baptist (6259765 PCT published 12/98). The Applicant notes that the Examiner seemingly inadvertently checked Box 3 of the Status section of the Office Action Summary (*Ex parte Quayle*). In addition to the arguments already set forth during earlier prosecution of the present application, the Applicant respectfully traverses the foregoing rejections and objections for the reasons set forth hereafter.

With respect to the objection to the drawings under 37 CFR 1.83(a) and the specification under 35 U.S.C. §112, first paragraph, the Applicant respectfully submits that the drawings and specification clearly describe where and how different voltages may be applied to the grid 120 with a grid voltage supply 124 that is a variable voltage supply. The drawings clearly illustrate the grid voltage supply 124, the grid 120, and the cathode filament 118. The specification states that the grid voltage supply 124 may be variable in order to apply an ion collection voltage on the order of 10 to 30 volts, a voltage to focus an electron beam on the order of 100 to 300 volts, and a voltage to stop the electron beam on the order of several kilovolts. Each of the voltages may be applied to the grid 120 to perform the corresponding functions (i.e., ion collection, electron beam focusing, stopping the electron beam) and are negative with respect to the filament bias connection 127. Such a variable grid voltage supply is currently claimed herein in the amended claims. Various means for adapting (i.e., controlling) an output voltage level of a variable voltage supply are well known in the art.

Turning to the Examiner's most recent arguments, the specification at page 3, lines 8-10 states the following:

> A focus grid voltage supply 124 (which may be a fixed or *variable* voltage supply) is connected between the focus grid and the filament.

One having ordinary skill in the art would know that a focus grid voltage supply 124 that is variable (clearly indicated as an embodiment above) and is connected to a focus grid may apply such a voltage to the focus grid. Further, the specification at page 3, lines 24-27 states:

> The grid voltage supply 124 produces a positive ion collection voltage on the order of 10 to 30 volts at several milliamps. The ion collection voltage sweeps free positive ions out of the X-ray tube 110 and, as explained in more detail below, reduces high voltage breakdown events in the X-ray tube 110.

Thus, the original disclosure teaches that ion collection voltage is supplied to the focus grid by the focus grid voltage supply, as the name clearly suggests; and, as stated above, the focus grid voltage supply may be variable, as explicitly recited at page 3, lines 8-10. Additionally, the original disclosure at page 3, lines 27-31 states:

> Note that the focus grid 120 may also be used to focus the electron beam or to stop the electron beam from reaching the anode 122. However, the voltage typically required to focus the electron beam is on the order of 100 to 300 volts, while the voltage typically required to stop the electron beam is on the order of several kilovolts.

Because the focus grid supply is connected to the focus grid, it is capable of supplying voltages to focus the electron beam and to stop the electron beam, as clearly stated above. The Applicant respectfully submits that the specification clearly discloses that electron focus and stopping voltages are applied to the grid by a focus grid voltage supply 124, as the name clearly suggests, in addition to the ion collection voltage. Further, as explicitly stated at page 3, lines 8-10 of the specification, the focus grid voltage supply 124 may be a variable voltage supply.

The Examiner states that tube operation requires that grid 120 be biased for electron focusing. However, the specification does not teach such a restriction and such a restriction is not claimed. Therefore, it is respectfully submitted that the Examiner's objections and/or rejections based on such a restriction should be removed.

As a side matter, the Applicant notes that the specification at page 3, lines 31-33 states, "Thus, the relatively small ion collection voltage neither interferes with electron beam focusing, nor propagation of the electron beam to the anode." The Applicant does not see how this portion of the specification "impl[ies] that the ion collection voltage and the electron focus voltage are applied at the same time," as stated by the Examiner. Further, the Applicant respectfully submits that there is nothing in this portion of the specification that limits the voltage supply to a fixed voltage supply, nor would one having ordinary skill in the art infer such a limitation.

Therefore, it is respectfully submitted that the means for supplying the different voltages to perform the different functions is clearly shown in the drawings and described in the specification as the variable grid voltage supply 124 being connected between the cathode filament 118 and focus grid 120 and, therefore, the objections to the drawings under 37 C.F.R. 1.83 (a) and to the specification under 35 U.S.C. §112, first paragraph, should be removed. Also, it is respectfully submitted that the rejection to claims 1-26 under 35 U.S.C. §112, first paragraph, for the same reasons set forth in the objection to the specification, should be removed as well.

The Applicant now turns to the rejection of claim 14 under 35 U.S.C. §112, second paragraph. The Applicant has amended claim 14 to read "an x-ray detector to receive an X-ray beam" in order to overcome this rejection.

The Applicant now turns to the rejection of claims 1-26 under 35 U.S.C. §103 as being unpatentable over Baptist (6259765 PCT published 12/98). The Applicant respectfully maintains that a prima facie case of obviousness has not been established. The outstanding Office Action only sets forth certain general teachings of Baptist in support of a general obviousness rejection of all of the pending claims 1-26. In the obviousness rejection, differences between the prior art and the claimed invention have not been identified. Also, no explanation has been provided that would serve as a motivation to the artisan to modify the prior art in a manner that would render obvious the claimed invention. Also, no discussion is provided concerning the alleged obviousness of the features of the dependent claims, for example, the Faraday cage.

Further, it is respectfully submitted that Baptist does not teach, nor suggest, the claimed invention. The claims generally concern an X-ray tube subsystem and method for operation thereof comprising a variable voltage supply connected between the grid bias connection and the filament bias connection to produce a negative output voltage level at the grid bias connection with respect

to the filament bias connection, the output voltage level of the variable voltage supply adapted to produce a first voltage level to focus an electron beam, a second voltage level to sweep free ions out of the X-ray tube, and a third voltage level to stop the electron beam. When the second voltage level (ion collection voltage) is applied to the grid, free positive ions that are created within the X-ray tube are swept away (i.e., collected) from the cathode filament by the grid to prevent high voltage breakdown events.

The prior art fails to teach or suggest structure or steps for creating/producing an ion collection voltage for collecting positive ions at a grid. Nor does the prior art teach or suggest the claimed cathode filament in combination with an ion collection voltage.

Baptist is concerned with a method for creating an electron beam using an electron cathode source with at least one microtip (not a filament) and using an extraction grid and magnetic field to help form and focus the electron beam. Baptist does not teach, nor suggest, a cathode filament or filament connection but instead describes a cathode microtip which substantially differs from a cathode filament. Baptist specifically teaches away from using a filament by stating "Furthermore, the structure of X-ray tubes with filaments does not make it possible to define any specific shape of the X-ray source, i.e. the zone of the tube from which the X-rays are emitted, in an accurate and controllable fashion." (column 3, lines 1-4).

Also, Baptist does not teach, nor suggest, collecting the positive ions or using a grid for ion collection. Instead, Baptist describes repelling or pushing the positive ions away from a separate, dedicated intermediate grid toward the anode to keep the positive ions away from the cathode microtip. Baptist applies a voltage potential to the separate, dedicated intermediate grid that is higher (more positive) than the voltage potential of the extraction grid to achieve the repulsion of the positive ions away from the dedicated grid towards the anode. Baptist teaches that this voltage potential is the same polarity as the anode potential and may even be higher in magnitude than the anode voltage potential (column 6, lines 59-67; column 7, lines 1-6; and column 10, lines 12 –16). In view of the foregoing differences between the prior art and the claimed invention, it is respectfully submitted that the claims are neither anticipated nor rendered obvious by the prior art.

Moreover, it is submitted that the dependent claims are non-obvious. When the X-ray tube produces positive ions, they tend to aggregate around the cathode filament and have an undesirable effect on an electric field around the cathode filament. By applying a negative ion collection

voltage to the grid (as in pending claim 1) in the range of 10 to 30 volts (as in pending claim 3), these positive ions are collected (swept away) by the grid. Baptist does not teach, nor suggest, an ion collection voltage and does not teach, nor suggest, applying a negative voltage in the range of 10 to 30 volts to a grid. Selection of an ion collection voltage (as in claim 11) is accomplished by determining the optimum ion collection voltage that minimizes high voltage breakdown events. Baptist does not teach, nor suggest, an ion collection voltage and does not teach, nor suggest, selecting an optimum ion collection voltage.

To focus the electron beam in a particular desirable manner, a voltage of greater than 100 volts is applied to the grid (as in pending claim 3). Baptist does not teach, nor suggest, applying a voltage to a grid for focusing an electron beam. The grid voltage supply can be susceptible to electromagnetic interference. A Faraday cage (as in pending claim 4) can be configured to surround the variable grid voltage supply to eliminate the unwanted interference. This is accomplished by connecting the Faraday cage to the filament bias connection. Baptist does not teach, nor suggest, a Faraday cage. The voltage applied between the anode and cathode of the X-ray tube is in the range of 100-150 kilovolts (as in pending claim 20). In column 6, lines 25-27 of Baptist, Baptist describes applying +5kV to +50kV between the anode and the microtip.

In view of the foregoing, it is respectfully submitted that the pending claims define allowable subject matter. A favorable action on the merits is respectfully requested.

Should anything remain in order to place the present application in condition for allowance, the Examiner is kindly invited to contact the undersigned at the telephone listed below. Please charge any additional fees or credit any overpayment to the Account No. 07-0845.

Respectfully submitted,
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